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(54) Abstract Title
Multi-ingredient beverage making apparatus and method

(57) A beverage making apparatus comprising a holder which holds a capsule 2 containing a beverage brewing ingredient 6, a source of hot liquid, an injector for injecting the hot liquid into the capsule 2 through a nozzle 7, whilst the capsule is held by the holder, to brew a beverage ingredient 6 within the capsule 2, and a control system programmed to prompt the user, via a display, to follow a number of sequential steps including insertion of the capsules 2 and waiting for the beverage ingredients 6 to brew. Preferably, the first capsule contains a different beverage ingredient from the second capsule, one of the capsules may contain a foamable beverage ingredient, and the nozzle may be inserted by the user in response to a prompt from the display. Each capsule may be in the form of a sachet 1 which is bonded by an adhesive, along its lower edge 5, that releases by the action of the hot water inside the sachet 1.

FIG. 1

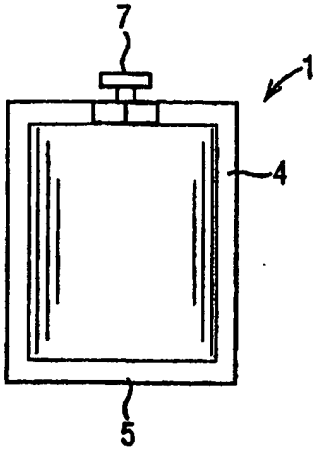

FIG. 2

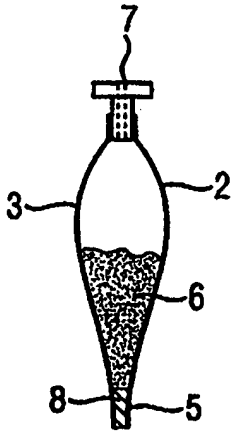

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FIG. 1

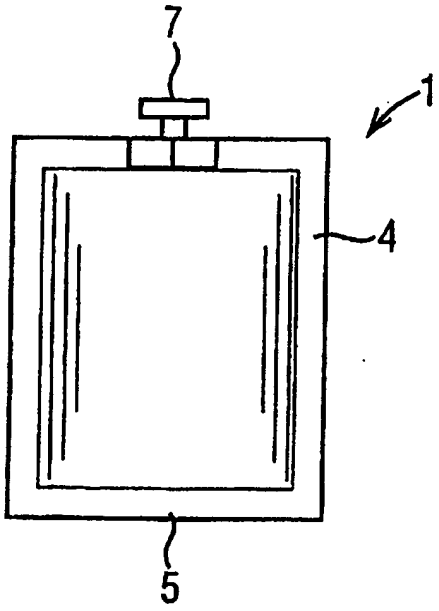
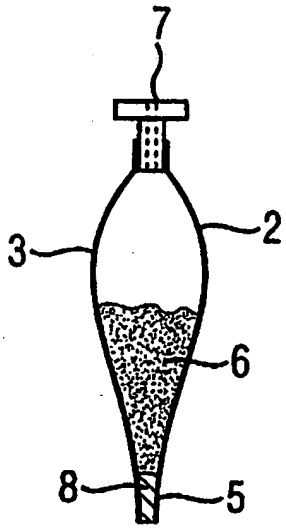


FIG. 2



MULTICOMPONENT BEVERAGE MAKING APPARATUS AND METHOD

The present invention relates to systems and methods for making multicomponent beverages, such as cappuccino coffee.

Multicomponent beverages are beverages that are formed by mixing two separately prepared liquid beverage components (other than water). Examples are cappuccino coffee and other frothy hot drinks, which are usually made by mixing a hot foamed milk with a freshly brewed coffee. The hot foamed milk is traditionally made by injecting steam under pressure through a hollow steam wand into cold fresh milk to heat and foam the milk. The milk foam is then poured onto liquid coffee to form the beverage, for example cappuccino or latte.

The milk foaming is normally carried out separately from the coffee brewing, because the essential oils present in coffee have a deleterious effect on foaming.

The traditional method of foaming hot milk foam for cappuccino or latte does not lend itself to use in beverage vending installations. This is in part because fresh or liquid milk is difficult to handle in such installations. Furthermore, most vending installations are not equipped to supply steam under pressure. In addition, the use of a steam wand immersed in the liquid milk could present cross-contamination problems.

It is known to provide a powdered beverage whitener containing encapsulated nitrogen gas that produces a foam when it is dispersed in coffee. However, the foam does not have the same bulk and stiffness (spoonability) as a conventional cappuccino foam.

Other examples of multicomponent beverages are for example "chocaccino" made by mixing a hot chocolate with a coffee.

The present invention provides a beverage making apparatus comprising: a holder for holding a capsule containing a beverage brewing ingredient; a source of

hot liquid and an injector for injecting the hot liquid into the capsule held in the holder to brew a beverage component in the capsule; and a control system and display programmed to prompt a user to carry out the following sequential steps in response to a command to brew a multicomponent beverage:

(a) insert a first capsule containing a first beverage brewing ingredient into the holder;

(b) wait while a first beverage component is brewed from the first capsule;

(c) insert a second capsule containing a second beverage brewing ingredient into the holder; and

(d) wait while a second beverage component is brewed from the second capsule.

It can be seen that the invention allows multicomponent beverages to be brewed from equipment having a single capsule holder in a straightforward way. The holder for the capsule will typically comprise a clamp that grips the capsule while water is injected into the capsule. The clamp may comprise jaws to grip at least a portion of the capsule. The apparatus may comprise a door or tray or drawer that opens to allow insertion of the capsule into the clamp, and that closes while liquid injection is taking place.

The control system and display may comprise for example a liquid crystal display and soft key controls. In addition to visual prompts on the display screen, the prompts (a) and (c) may include mechanically opening the capsule holder to permit insertion of a capsule.

The beverage brewing apparatus may further provide a prompt after prompt (d), as follows: (e) remove finished beverage from the apparatus.

In typical embodiments the prompt (a) directs the user to insert a capsule containing a foamable beverage component, for example a foamable whitener such as a spray dried milk powder. It is preferable to foam the milk first, since the second ingredient (e.g. coffee) tends to inhibit foaming.

Typically, the beverage brewing apparatus according to the invention has the control system and display programmed to prompt a user to select a beverage prior to said step (a). The prompt to select a beverage may be by means of one or more menu selection screens accessed by soft keys.

The apparatus may also be programmed to prompt the user to provide a payment before said step (a). The payment may be by means of a coin-freed mechanism, or a card swipe, or some other automatic debiting procedure provided in the system.

Preferably, the control system is programmed to provide a partial refund of the payment if the brewing cycle is interrupted before the second beverage component is brewed from the second capsule. For example, a value equal to the value of the second beverage component only may be refunded.

The display may show a welcome screen, such as a logo or a picture of a cup of coffee, when not in use. The apparatus may also be programmed to prompt the user to place a receptacle in the apparatus before said step (a). The apparatus may comprise a cup-detect interlock, for example an infrared detector interlock, to block or interrupt the operation of the apparatus if there is no receptacle in a beverage receiving position in the apparatus.

In a second aspect the present invention provides a beverage brewing system comprising a beverage brewing apparatus according to the invention, at least one first capsule containing a first beverage component, and at least one second capsule containing a second beverage component different from the first component. Preferably, the first beverage component comprises a foamable beverage ingredient and the second beverage component comprises coffee or tea.

The invention further provides a method of brewing a beverage, comprising the steps of: providing a beverage brewing system according to the invention, instructing the system to brew a multicomponent beverage, and inserting the first

and second capsules into the holder in response to prompts provided by the system in order to brew the said multicomponent beverage.

In certain embodiments the method comprises the steps of: providing a capsule containing a foamable ingredient and having an outlet for allowing fluid to escape from the capsule; providing a receptacle positioned to collect fluid escaping from the capsule through the outlet; injecting aqueous liquid into the capsule to mix with the foamable ingredient; allowing the foamable ingredient mixed with the aqueous liquid to escape through the outlet into the receptacle; followed by injecting further aqueous liquid into the receptacle through a jet having a jet diameter of from about 0.5 to about 2 mm to produce a foamed liquid in the receptacle.

The foamable ingredient is any food-acceptable substance that will form a foam on high shear mixing with water. The foamable ingredient is usually at least partially dehydrated for ease of handling and maximum storage stability. Typically the foamable ingredient comprises a partially or completely dehydrated dairy or non-dairy beverage whitened such as milk. Preferably, the foamable ingredient consists essentially of a foamable dairy or non-dairy milk concentrate, for example a granulated dried milk or a spray dried milk powder, optionally fat reduced. In certain embodiments the ingredient comprises an instantised milk granulate. Various milk powders are suitable, and the fat content and other characteristics of the milk powder can be optimised for each case. The milk powder may form part of a hot chocolate drink or other beverage. In other embodiments the foamable ingredient may comprise chocolate or another beverage ingredient such as coffee.

The dry weight of the foamable ingredient may be from about 1 to about 50g, preferably from about 5 to about 15g. In other words, the amount of the ingredient in each capsule is preferably sufficient for one portion of a foamed product, e.g. one cup of a foamy beverage.

The capsule is normally disposable after one use. The capsule may comprise at least one side formed from a substantially rigid sheet material. For example,

capsules having substantially cylindrical or truncated conical shapes are envisaged. More typically the capsule comprises a body formed at least in part from flexible film material, for example a tubular sachet formed on a form-fill-seal machine, or a body formed by bonding together front and back sheets of film material around the edges thereof to define a sachet. The capsule will normally be substantially air and moisture impermeable before use in order to preserve the food ingredient in a shelf stable condition. Preferably, the package is substantially shelf stable. That is to say, it may be stored at ambient temperature and atmospheric conditions for a period of at least 3 months, preferably at least one year, without significant deterioration of the contents.

In certain embodiments the internal volume of the capsule is from about 25 to about 100 cm^3. The internal volume refers to the maximum volume of the capsule when any flexible parts are fully distended. This internal volume is typically at least twice the volume of the foamable ingredient, in order to allow space for turbulent flow and mixing of the aqueous liquid with the ingredient in the capsule.

The capsule may be provided with an inlet nozzle, for example as described in EP-A-0179641 or WO-A-9905036. In certain embodiments the method may comprise injecting liquid into two or more inlets in the capsule in order to improve mixing with the foamable ingredient. The two or more inlets may be connected through a manifold to a single liquid inlet duct. At least one of the inlets may be angled to assist turbulent mixing and washing out of the capsule.

The method according to this aspect of the invention initially operates by enabling, first, turbulent mixing of the liquid and the foamable ingredient in the capsule, followed by deposition of the resulting mixture into the receptacle and jetting liquid into the mixture in the receptacle to provide foaming. The use of a capsule removes earlier problems with direct deposition of milk solids into a receptacle and provides a better quality foam in larger quantities.

In certain embodiments the outlet of the capsule is sealed by freshness barrier. The term "freshness barrier" refers to a barrier that is substantially impermeable to

air or moisture so as to preserve the freshness of the foamable ingredient by preventing ingress of air or moisture through the liquid guide before brewing commences. The freshness barrier may be released by an external mechanical force or thermal field applied during brewing. The freshness barrier is preferably releasable by the action of pressure and/or hot water from inside the capsule during brewing. For example, the freshness barrier may comprise a layer of a sealant that is released by the action of heat and/or moisture, such as an adhesive as described in EP-A-0179641 or WO99/05036.

For example, in certain embodiments the capsule comprises two flexible sheets bonded together along a seam situated opposite the inlet, said bonding being releasable by the action of heat or pressure inside the capsule, whereby the two sheets peel apart under said action to provide said opening.

Preferably, where the outlet is sealed by a freshness barrier as hereinbefore described, the injection of liquid into the capsule initially causes mixing with the foamable food ingredient. The freshness barrier is then released to form said opening, thereby releasing the food ingredient into the receptacle.

Preferably, the aqueous liquid consists essentially of water, optionally mixed with steam. In certain embodiments the liquid is injected into the capsule at a pressure of from about 30 kPa (0.3 bar) to about 200kPa (2 bar). These pressures are suitable for use in vending equipment without special measures.

In certain embodiments the liquid is injected in a two stages: a first, relatively low pressure stage to achieve mixing with the foamable ingredient without bursting the capsule, followed by a second, high pressure stage to open the outlet and release the contents into the receptacle

Preferably, the liquid is injected into the capsule containing the foamable material by a peristaltic or piston pump, preferably at an average rate of from about 250 to about 2000 ml/min and more preferably from about 500 to 1500 ml/min. The liquid may be injected in intermittent or pulsed fashion to optimise the amount of foam or

the organoleptic properties of the product. Preferably, the method further comprises the step of injecting air into the capsule after injecting the liquid to expel residual liquid from the capsule.

In certain embodiments the total amount of liquid injected into the capsule containing the foamable material is from about 25 ml to about 100ml. For a hot foamed beverage the temperature of the liquid is typically from about 75 to about 100 degrees C.

The step of injecting liquid into the capsule containing the foamable material is followed by the step of injecting a jet of liquid into the receptacle containing the liquid/foamable ingredient mixture. The high velocity and narrow diameter of the liquid jet provide strong shear forces that give rise to the formation of a thick foam.

The jet is normally formed by pumping liquid into a narrow-bore jet-forming inlet. The inlet may be situated adjacent to the capsule containing the foamable material. Alternatively, the inlet may be moved into the place of the capsule following ejection of the capsule from the beverage brewer. The internal cross-section of the jet-forming inlet is normally a regular shape, and preferably it is substantially cylindrical. Preferably, a circular water jet is produced having a diameter of from about 0.5 to about 2 mm, preferably from about 0.7 to about 1.5 mm. Since water is substantially incompressible and not significantly viscoelastic, it follows that the internal cross sectional area of the jet-forming region of the inlet and/or the outlet is generally from about 0.2 to about 3 mm^2, preferably from about 0.4 to about 2 mm^2, for example about 1 mm^2.

If the narrow bore, jet forming region of the inlet is too short, then the inlet tends to form a spray rather than a jet. If the narrow bore is too long, then the pressure drop across the inlet may be too high. Accordingly, the narrow bore region preferably extends for a distance of from about 1 to about 5 mm, preferably about 2 to about 4 mm along the direction of liquid flow.

Typically, the jet velocity of the liquid jet is from about 3 to about 50 m/s, preferably from about 5 to about 15 m/s. This gives sufficient shear on impact with a liquid body in the receptacle to provide effective foaming. The temperature of the liquid is preferably from about 80 to about 100°C. The liquid is preferably supplied to the inlet at a pressure of from about 0.4 to about 2 bar (40 to 200 kPa), preferably about 0.8 to about 1.2 bar (80 to 120 kPa) which is achievable with conventional vending equipment. The flow rate per jet is preferably from about 4 to about 40 ml/sec, preferably from about 6 to about 18 ml/sec. A plurality of jets may be provided to speed up the rate of liquid addition and foam formation. Preferably, at least one liquid jet is inclined at an angle to the vertical in order to achieve swirling of the liquid in the receptacle. Preferably, the total amount of liquid jetted into the receptacle is from about 30 to about 150 ml, more preferably from about 50 to about 100 ml.

In yet other embodiments the beverage brewing apparatus further comprises the following prompts between prompts (b) and (c):

(f) insert a liquid jet nozzle into the holder;

(g) wait while a high velocity jet of liquid is pumped through the nozzle.

Preferably, the liquid jet nozzle is dimensioned as described above to provide a high velocity jet. These embodiments have the advantage that existing equipment can be modified for foamed beverage production without the need to retrofit jet nozzles. Also, the removable jet nozzle inserted in step (f) can be made disposable to avoid problems of scale build-up in jet nozzles.

The receptacle is typically a cup, for example a polystyrene cup. Typically, the bottom of the receptacle is located from 5 to 25cm below the outlet of the capsule.

It is occasionally found that the method described above produces a foam having undesirable large bubbles near the top. In such cases the method preferably further comprises the step of applying a water spray to the top of the foam in the receptacle after the step of water injection. The water spray disperses the larger

bubbles. Typically the water spray is applied for 1 to 5 seconds and has a small droplet size.

Preferably, the method further comprises the step of mechanical ejection of the capsule from the holder after the step of injecting liquid into the capsule. For example, the beverage brewer may comprise a waste bin into which the capsule is automatically and mechanically discarded.

Preferred methods according to the invention further comprise the steps of: providing a second capsule containing a beverage brewing ingredient and having an outlet for allowing fluid to escape from the capsule; injecting water into the second capsule to brew a beverage inside the capsule; and allowing the beverage to escape through the outlet into the receptacle.

Typically, the beverage brewing ingredient comprises ground coffee or leaf tea, preferably in an amount suitable to brew a single cup of beverage. For example, from about 2g to about 12g of ground coffee or from about 1g to about 9g of leaf tea. It will be appreciated that the construction of the capsule containing a beverage brewing ingredient will normally be substantially similar to the construction of the capsule containing a foamable food ingredient. It is a particular advantage of the present invention that the capsules can be manufactured and filled on the same equipment, and can be fed sequentially into the same capsule holding, brewing and manipulating mechanism. The beverage brewing capsule may additionally comprise a filter element, such as a filter paper bonded to an interior surface thereof.

The liquid may be injected into the capsule containing the beverage brewing ingredient in amounts, at pressures, and at temperatures similar to those described above in relation to the capsule containing the foamable ingredient.

In other embodiments the liquid is injected into the capsule containing the beverage brewing ingredient at pressures of from about 200 kPa to about 2 MPa (about 2 to about 20 bar), preferably from about 200 kPa to about 1 Mpa (about 2 to about 10 bar). These pressures are conventionally generated for brewing

espresso coffee. Preferably, the liquid injected in this stage of the process consists essentially of water.

Preferably the total amount of liquid injected in the process is from 100 to 400 ml. Preferably the product comprises from about 10% to about 50% of foam by volume, more preferably from about 20% to about 35% foam by volume.

In certain embodiments a first pump may be used to supply liquid to both the capsule injector and to the liquid jet outlet. More usually a second pump is provided for supplying liquid to the liquid jet . The liquid preferably consists essentially of water.

The beverage brewer preferably further comprises a mechanical ejection means for ejecting capsules from the holder after water injection is complete.

Preferably, the apparatus further comprises a mechanism operatively associated with the holder to retract the injection tube or tubes when the holder is opened.

The liquid jet outlet is preferably directed downwardly at a small angle to the vertical in order to swirl the beverage being foamed.

Specific embodiments of the present invention will now be described further, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 shows a plan view of a capsule containing a foamable ingredient for use in the methods according to the present invention;
Figure 2 shows a longitudinal sectional view through the capsule of Figure 1; and

Referring to Figures 1 and 2, the capsule 1 is in the form of a sachet formed from two sheets of laminated, metallised flexible plastic film 2,3 bonded together around a margin 4. A lower margin 5 of the sachet is bonded by means of a layer of adhesive 8 that can be released by the action of hot water inside the sachet. In a top margin of the sachet a nozzle 7 is inserted between the sheets 2,3 and bonded

thereto in air tight fashion. The capsule has an internal volume of approximately 50cm^3 when fully distended. Thus far the construction of the package 1 is similar to the beverage brewing sachets described in EP-A-0179641 or WO99/05036. The capsule is approximately half filled with approximately 5-10g of a foamable powdered milk 6.

The nozzle 7 is formed by injection moulding of a thermoplastic material such as polypropylene. It is bonded by adhesive or melt bonding in air tight fashion to the front and back sheets 2, 3 of the sachet. The nozzle 7 comprises a bore region having an internal diameter of approximately 3mm, into which a water injection tube 15 is inserted in use. A flange is provided at the top of the nozzle to assist mechanical gripping and manipulation of the sachet in the brewing apparatus. Finally, a plastics laminated foil freshness barrier (not shown) is sealed over the top of the nozzle. This results in a fully air tight and moisture-tight package that is shelf stable.

The process is initiated by a user selecting a foamed beverage option from the vending equipment. The display prompts the user to insert a milk powder capsule, and opens a door leading to a beverage brewing enclosure equipped with the capsule holder. The machine then automatically grips the capsule, and injects water into the capsule for a predetermined time to achieve the initial mixing and to deposit the water and milk powder mixture into the receptacle. The machine then automatically discards the spent capsule.

The display then opens the door leading to the beverage brewing enclosure and prompts the user to insert a jet nozzle into the holder. The jet nozzle is a disposable thermoplastic nozzle having an internal diameter adapted to provide a high velocity jet of water of diameter about 1mm. Once the nozzle is inserted, the apparatus pumps water through the nozzle where it forms a high velocity jet into the receptacle, where it forms a milky foam by high shear mixing entraining air into the liquid. The jet diameter is about 1 mm, the jet velocity is about 5 m/s and the amount of water injected through the jet is about 60 ml. The system then automatically discards the nozzle.

The machine then prompts to the user to insert a second beverage brewing capsule. The user can select the desired beverage capsule, for example of coffee, insert it into the same holder in the machine, whereupon the machine automatically injects water into the capsule to brew the beverage inside the capsule and to release the barrier at the bottom of the capsule to release the beverage into the receptacle. The brewed coffee escapes from the bottom of the capsule and drops through the foam layer into the liquid layer in the receptacle. Finally, the machine automatically discards the spent brewing beverage capsule.

The above embodiments have been described by way of example only. Many other embodiments falling within the scope of the accompanying claims will be apparent to the skilled reader.

CLAIMS

1. A beverage making apparatus comprising:

a holder for holding a capsule containing a beverage brewing ingredient;

a source of hot liquid and an injector for injecting the hot liquid into the capsule held in the holder to brew a beverage component in the capsule; and

a control system and display programmed to prompt a user to carry out the following sequential steps in response to a command to brew a multicomponent beverage:

(a) insert a first capsule containing a first beverage brewing ingredient into the holder;

(b) wait while a first beverage component is brewed from the first capsule;

(c) insert a second capsule containing a second beverage brewing ingredient into the holder; and

(d) wait while a second beverage component is brewed from the second capsule.

2. A beverage brewing apparatus according to claim 1, wherein the prompts (a) and (c) include mechanically opening the capsule holder to permit insertion of a capsule:

3. A beverage brewing apparatus according to claim 1 or 2, further comprising a prompt after prompt (d), as follows:

(e) remove finished beverage from the apparatus.

4. A beverage brewing apparatus according to any preceding claim, wherein the prompt (a) directs the user to insert a capsule containing a foamable beverage component.

5. A beverage brewing apparatus according to any preceding claim, further comprising the following prompts between prompts (b) and (c):

(f) insert a liquid jet nozzle into the holder;

(g) wait while a high velocity jet of liquid is pumped through the nozzle.

6. A beverage brewing apparatus according to any preceding claim, wherein the control system and display are programmed to prompt a user to provide a payment and select a beverage prior to said step (a).

7. A beverage brewing apparatus according to claim 6, wherein the control system is programmed to provide a partial refund of the payment if the brewing cycle is interrupted before the second beverage component is brewed from the second capsule.

8. A beverage brewing system comprising a beverage brewing apparatus according to any preceding claim, at least one first capsule containing a first beverage component and at least one second capsule containing a second beverage component different from the first ingredient.

9. A beverage brewing system according to claim 8, wherein the first beverage component comprises a foamable beverage ingredient and the second beverage component comprises coffee or tea.

10. A method of brewing a beverage, comprising the steps of: providing a beverage brewing system according to claim 8 or 9, instructing the system to brew a multicomponent beverage, and inserting the first and second capsules into the holder in response to prompts provided by the system in order to brew the said multicomponent beverage.

INVESTOR IN PEOPLE

Application No: GB 0122514.3
Claims searched: 1 to 10

15

Examiner: Dean Parry
Date of search: 14 December 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): A4E

Int Cl (Ed.7): A47J (31/24, 31/34, 31/40, 31/44), B65D81/34

Other: Online: EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	EP 0426478 A	(MARS GB) see whole document and figures.	
A	US 5134924 A	(VICKER) see whole document and figures.	
A	US 4899911 A	(ROHDE) see whole document and figures.	
A	US 4738378 A	(OAKLEY) see whole document and figures.	
A	US 4220259 A	(LAGNEAUX) see whole document and figures.	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.